

# LABOR ANALYSIS OF DAIRY BARN CHORES

*by*

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### ACKNOWLEDGMENT

This study was conducted jointly by the Farm Economics Branch of the Ontario Department of Agriculture and the Economics Division of the Canada Department of Agriculture in 1952-53. Field and office work were under the supervision of Dr. H.L. Patterson, Director of the Farm Economics Branch.

## LABOR ANALYSIS OF DAIRY BARN CHORES

Each year over thirty million hours of labor are required to do dairy chores on Ontario farms. Most of this work is of a routine nature, being done twice a day, every day. With almost one-third fewer persons working in agriculture in Ontario than in 1935<sup>1</sup> and with the wages of hired help having practically quadrupled during the past twenty years<sup>2</sup> a definite farm labor problem has arisen. The purpose of this study is to assist farmers by providing a guide for the measurement of dairy labor efficiency and to describe what some farmers have done to reduce time and travel in dairy chores.

The fact that some farmers have improved their work methods much more than others is evident from a study of dairy labor requirements on 1,086 Ontario Dairy Herd Improvement farms in 1952. Some of the dairymen on

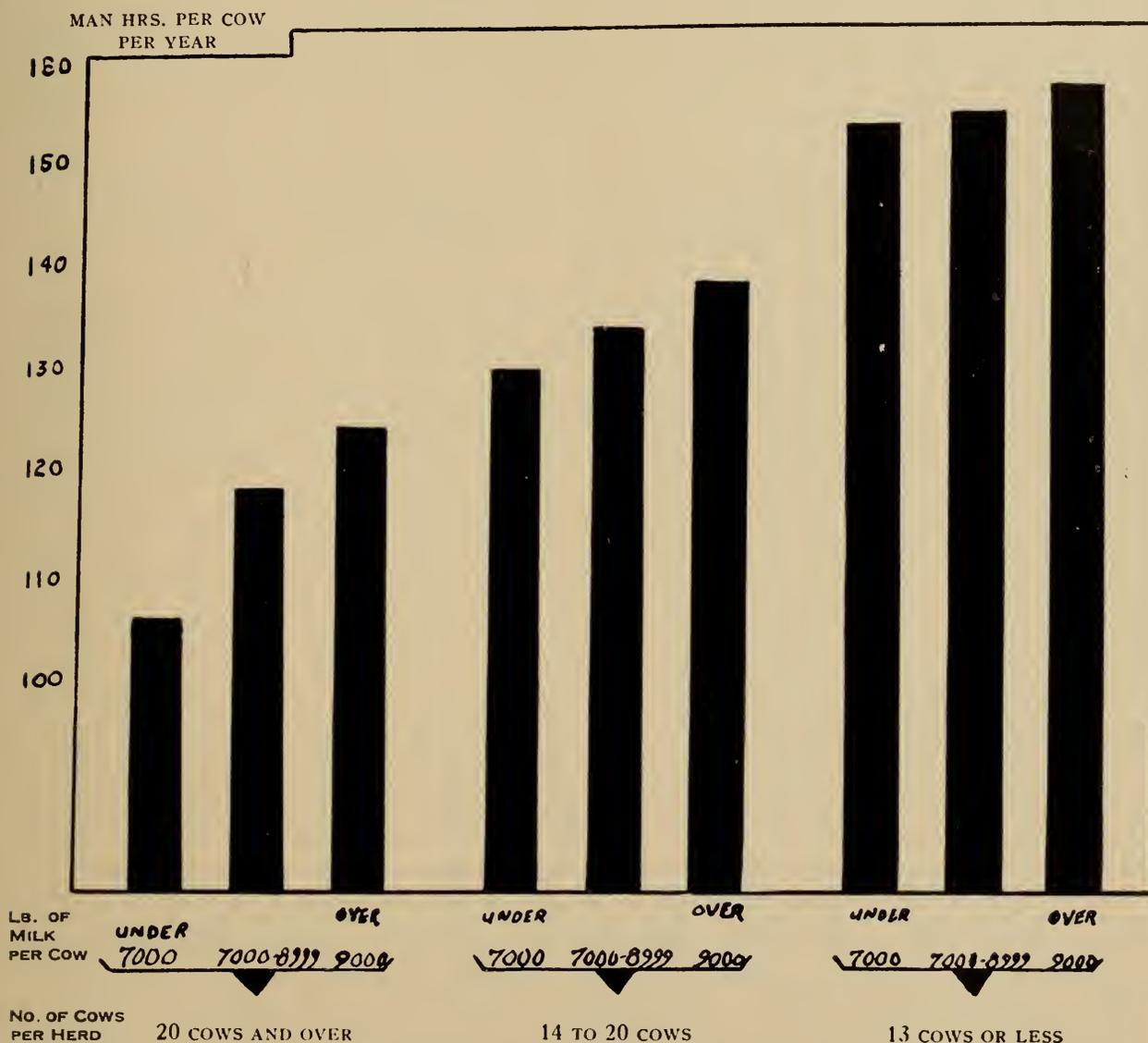


FIGURE 1.—The relationship between the number of cows per herd and pounds of milk per cow on the man hours required per year.

<sup>1</sup> Dominion Bureau of Statistics, Tables 17 and 65.  
 Dominion Bureau of Statistics, Reference Papers 33 and 35.  
<sup>2</sup> Agricultural Statistics for Ontario, 1952, page 8.

these farms cared for their herds in less than 100 hours per cow per year whereas others required twice that amount of labor. Two important factors affecting labor efficiency were herd size and production per cow (Fig. 1). Other equally important factors were the causes of the wide variations in efficiency within each size-of-herd group. Some farmers within each group did not follow any definite plan in doing work whereas others observed their own routine, studied alternative methods of improving work programs and made decisions which led to increased efficiency in the use of their labor resources.

Most farmers can now increase labor efficiency by a systematic study of the time and steps required to perform various types of work. Increasing the efficiency of routine dairy chore work is important. Although labor ranks second to feed as a dairy cost item, little progress has been made in the reduction of labor needed in the barn since the invention of the milking machine. The time has come to search for new ways of saving labor.

*A Method of Studying Dairy Barn Chores.*—In a study of dairy barn chores a farmer should enlist the help of someone who is in sympathy with his aims. He may find it preferable to select an outsider who will observe the work being done without having any preconceived ideas as to how it should be done.

The watcher's equipment should consist of paper, pencil, tape measure, a clipboard and a stop-watch (any good watch with a second hand will do). The sheets of paper may be ruled vertically and include columns as follows:

(1) Watch reading	(2) Time taken	(3) Operation	(4) Code	(5) Distance

Before taking a time and travel record a scale plan of the barn should be drawn showing stanchions, silos, grain storage, chutes and location of equipment. This drawing will be found indispensable when it comes to answering questions such as, "Is this trip really necessary?", or, "Is there an easier and better way of doing it?"

Once the major distances have been recorded by the enumerator the farmer can go about his tasks in the barn in the usual manner, neither speeding up the chore routine nor slowing it down. The watcher follows him with clip-board, time study chart, and time-piece (Fig. 2). The watch is started as the farmer begins and continues until the work is finished. The watch readings and distances walked are recorded in columns (1) and (5) respectively and a brief description of the job is entered in column (3). There is no need to work out the time taken (column 2) for each operation until after the work has been completed. Similarly, a code for each job (example: handle milker (M); care for milk (D); machine strip (R); wash equipment (Z) can be put in at a later date to simplify the grouping together of similar jobs. This procedure of collecting detailed data was used as the basis for analyzing dairy barn chores in 1952-53.

NAME \_\_\_\_\_

WORKER \_\_\_\_\_ RECORDER \_\_\_\_\_ DATE \_\_\_\_\_ AM \_\_\_\_\_ P.M. \_\_\_\_\_

WATCH READING	TIME TAKEN	OPERATION	CODE	DISTANCE
42.85		m on # 16		5
47.95		to cow # 14		18
48.10		mach strip # 14		—
48.50		m off # 14		—
48.85		# 14 out		8

FIGURE 2.—Clipboard, stopwatch, and time study chart used in taking records.

A time study chart (Fig. 2) gives only descriptions and comparisons when completed. It will not tell a farmer how to improve his work but will indicate likely places for improvement. The development of improved work methods is largely an individual problem and must be worked out for each farm with the aid of the work charts and floor plans. Steps that call for improvement may be noted by checking each job and each part of a job against the following procedure.<sup>1</sup>

- 1) Eliminate, combine or re-arrange the details of a job or jobs for better order.
- 2) Have buildings and work areas close together to reduce travel.
- 3) Provide for circular travel to eliminate back-tracking.
- 4) Provide paths, alleys and doorways that are sufficiently wide, level, and smooth for carts.
- 5) Locate tools and supplies at the place where the work is done.
- 6) Plan to complete one operation where another begins.
- 7) Haul maximum practical loads to reduce trips.
- 8) Work at a reasonable speed—avoid wasting energy.
- 9) Review the chore routine in order to make it more systematic and logical.

After the new routine has been worked out and put into practice for a few days, the chores should again be timed in order to get the best possible arrangement. Individual savings are usually small but when added to other savings and repeated 730 times each year the total result is usually a very worthwhile goal.

<sup>1</sup> Vaughan, L. M., and L. S. Hardin, *Farm Work Simplification*, New York, John Wiley and Sons, Inc., and London, Chapman and Hall, Ltd., 1949, p. 59.

## STANDARDS OF ACCOMPLISHMENT FOR THE DAIRY FARMER

For many years standards have been used to assist farmers in planning their farm operations; the best known of these are probably the feeding standards. Rates of seeding and fertilizer applications are among others that are in common use. These standards are not to be applied rigidly, they are prepared mainly to provide the farmer with a guide for making adjustments on his own farm. Standards (or averages) of measurement in work can serve the same general purpose.

### 1. Standard Time and Distances Travelled in Stanchion Barns

To determine standard time requirements and distances travelled for tasks in stanchion barns ten dairy farms, with a total of 237 milking cows, were studied in detail. Scale plans of the barns and time-and-travel records for morning and evening milkings were used. All operators had average skill and training and were efficient in overall farm management practices.

An examination of the standards presented in Table 1 indicates that it is preferable to have cows facing out, rather than facing in, in a two-row stanchion barn. As shown in Table 2 almost three times as much work had to be done and three times as long a distance covered when doing the work behind the cows as when doing the work in front of the cows. Work will, therefore, be restricted to a smaller area and steps will be saved if the cows face out.

Table 1.—Standard Time and Distances Travelled in Stanchion Barns

	Milking Operations					
	Time Required per Cow per Day				Distance Travelled per Cow per Day	
	Summer		Winter		Summer	Winter
	min.	sec.	min.	sec.	feet	
Prepare equipment.....	..	40	..	44	33	29
Wash udder.....	..	39	..	55	40	38
Handle milker.....	..	76	..	88	98	89
Care for milk.....	..	87	..	83	113	83
Handle cows.....	..	70	..	10	66	3
Hand strip.....	..	46	..	43	14	8
Machine strip.....	..	59	..	78	21	30
Wait.....	..	54	..	68	7	11
Wash equipment.....	..	43	..	74	32	26
<b>Total.....</b>	<b>8</b>	<b>34</b>	<b>9</b>	<b>2</b>	<b>424</b>	<b>317</b>
	Other Chores					
	Time Required per Cow Equivalent* per Day				Distance Travelled per Cow Equivalent per Day	
Feed hay.....	..	1	..	53	..	29
Feed silage.....	..	6	..	53	2	28
Feed grain.....	..	5	..	31	8	27
Clean stables.....	..	2	..	80	3	37
Bedding.....	..	..	..	31	..	19
Feed calves.....	..	5	..	20	5	14
<b>Total.....</b>	<b>..</b>	<b>19</b>	<b>4</b>	<b>28</b>	<b>18</b>	<b>154</b>

\* Cow equivalent—the equivalent of one mature cow in feed requirements.

Table 2.—Time and Distances Travelled in Stanchion Barns

Work	Time Required per Cow per Milking			Distance Walked per Cow per Milking	
	min.	sec.	per cent	feet	per cent
Behind the cows.....	3	52	49	259	49
In front of the cows.....	1	22	17	89	16
Other*.....	2	43	34	186	35
<b>Total.....</b>	<b>7</b>	<b>57</b>	<b>100</b>	<b>534</b>	<b>100</b>

\* "Other" refers to preparing equipment, caring for milk, washing equipment, feeding calves and pitching down hay.

Similar findings were made through an examination of the chore times required by the Dairy Herd Improvement Farmers of Ontario. On the average, more time was required per 100 pounds of milk in a one-row stanchion barn than in any other type of stanchion barn, the least time being needed when the cows faced out in a two-row stanchion barn with large end doors.

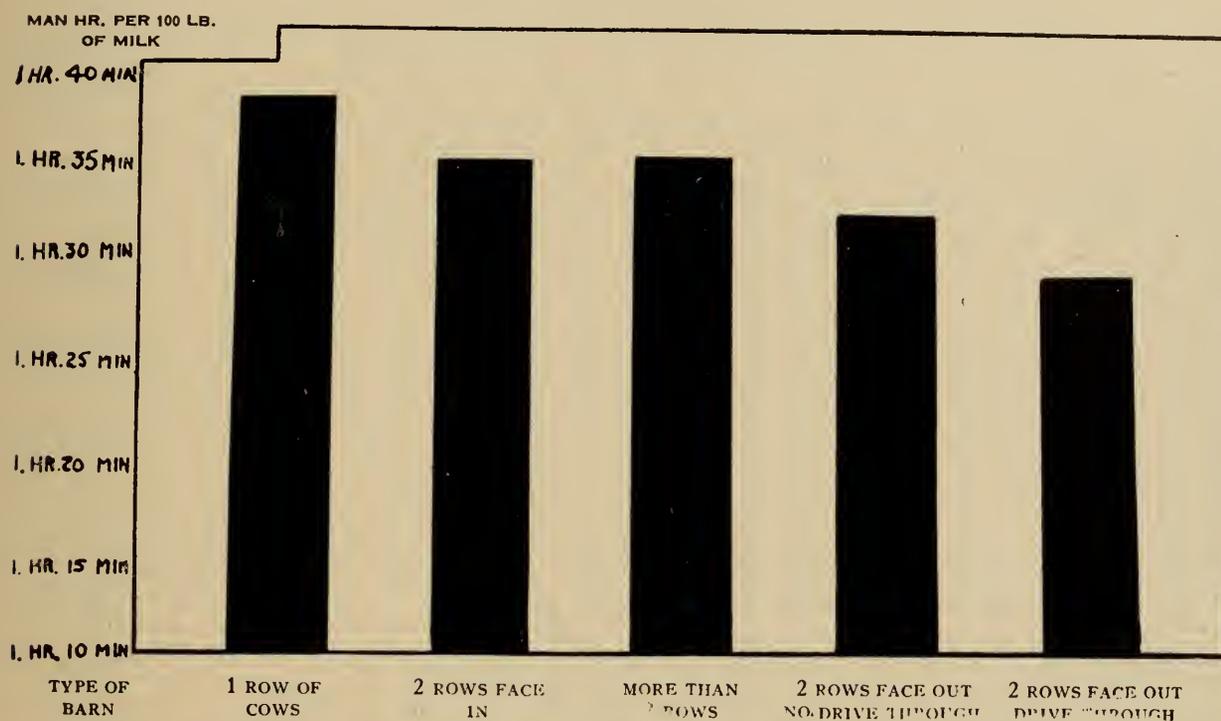


FIGURE 3.—Relationship between barn types and hours of labor required in the production of milk—1,086 herds.

The time spent in a stanchion barn varies from farm to farm. To arrive at a goal for a given farm the number of cows milked and cow equivalents should

Table 3.—Chore Time and Distances Walked per Day in Stanchion Barns

	Time Required per Day				Distance Travelled per Day	
	Summer		Winter		Summer	Winter
	hr.	min.	hr.	min.	miles	
Milking operations.....	2	52	3	1	1.6	1.2
Other chores.....	..	10	2	14	.1	.9
<b>Total.....</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>15</b>	<b>1.7</b>	<b>2.1</b>

be used together with the time standards. If a farmer has 20 milking cows and 30 cow-equivalents, the time taken to do the dairy chores will be as indicated in Table 3.

## 2. Standard Time and Distances Travelled in Loose-Housing Barns

Chore work done in loose-housing barns differs considerably from that in stanchion barns. New standards must, therefore, be determined. Ten farms having 219 milking cows and using the loose-housing system were time-studied in detail. The operators had average skill and training in handling cows in loose-housing barns. In future years the standards presented in Table 4 may have to be revised as this manner of handling cows is still comparatively new on Canadian farms.

Table 4.—Standard Time and Distances Travelled in Loose-Housing Barns

	Time Required per Cow per Day				Distance Travelled per Cow per Day	
	Summer		Winter		Summer	Winter
	min.	sec.	min.	sec.	feet	
Prepare equipment.....	..	37	..	29	27	25
Wash udder.....	..	42	..	50	24	26
Handle milker.....	..	79	..	112	48	69
Care for milk.....	..	68	..	80	48	68
Handle cows.....	..	114	..	93	95	59
Hand strip.....	..	5	..	8	2	2
Machine strip.....	..	42	..	46	20	16
Wait.....	..	95	..	66	15	14
Wash equipment.....	..	69	..	36	26	25
<b>Total.....</b>	<b>9</b>	<b>11</b>	<b>8</b>	<b>40</b>	<b>305</b>	<b>304</b>
	Other Chores					
	Time Required per Cow Equivalent* per day				Distance Travelled per Cow Equivalent per Day	
Feed hay.....	..	..	..	16	..	5
Feed silage.....	..	..	..	26	..	9
Feed grain.....	..	13	..	28	10	23
Clean stable.....	..	4	..	13	2	8
Bedding.....	..	1	..	14	2	5
Feed calves.....	..	6	..	21	6	12
<b>Total.....</b>	..	<b>24</b>	<b>1</b>	<b>58</b>	<b>20</b>	<b>62</b>

\* Cow equivalent—the equivalent of one mature cow in feed requirements.

*Comparison of Time and Travel in Stanchion and Loose-Housing Barns.*—A comparison of the time and travel records for stanchion and loose-housing barns revealed that in the loose-housing barns 14 per cent less time and 27 per cent less travel were required annually than in the stanchion barns. Savings in winter dairy chores in loose-housing barns accounted for the major difference. Only about three-quarters as much time and three-quarters as many steps were used to look after 20 milking cows and 30 cow equivalents in loose-housing as compared with stanchion barns (Table 5). During the summer months, six per cent more chore time was needed in the loose-housing barns than in the stanchion barns. This difference in time was due mainly to the fact that cows moved slowly into stalls at milking time.

Table 5.—Comparison of Time and Distances Travelled in Stanchion and Loose-Housing Barns

	Time Required per Season		Distance Travelled per Season	
	Summer	Winter	Summer	Winter
	hours		miles	
Stanchion barn.....	546	971	306	389
Loose-housing barn.....	588	719	228	278
<b>Increase or decrease.....</b>	<b>42</b>	<b>-252</b>	<b>-78</b>	<b>-111</b>
<b>Percentage increase or decrease...</b>	<b>6</b>	<b>-26</b>	<b>-25</b>	<b>-28</b>
<b>Percentage annual decrease.....</b>		<b>14</b>	<b>27</b>	

### VARIATIONS IN DAIRY CHORE TIME PER COW

(1) *Milking Operations.*—Among the farms time-studied, there was a wide range in the milking machine time per cow. The longest average time per cow per farm was 277 per cent of the shortest time (Fig. 4). Despite the fact that all cows can be trained to milk out rapidly, only 37 per cent of the cows included in this study were milked out in five minutes or less.

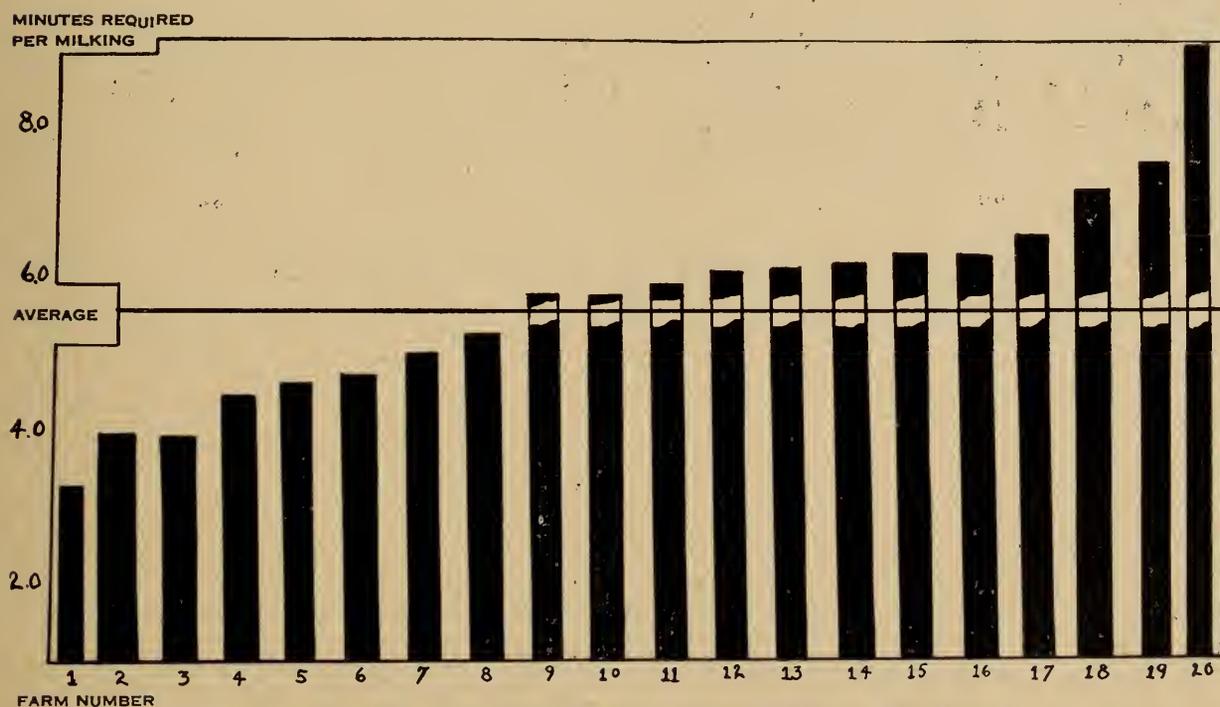


FIGURE 4.—Milking machine time per cow on 20 Ontario dairy farms.

The time spent in milking individual cows varied even more than the average time per cow per farm. The irritation caused by the milking machine after the udder is emptied of milk can cause bruises which may make the cow susceptible to mastitis infection. To avoid this and save labor a fast uniform system of milking should be followed.

(2) *Other Chores*.—Great differences in time also occurred among farms in feeding, cleaning and bedding operations. The feeding operations shown in Fig. 5 are typical of "other" chore work. When hay was fed efficiently, grain and silage were usually fed inefficiently. Few farmers did all jobs well. Some required four times as long to do work as others. In general, less time was required for cleaning, feeding, bedding and looking after calves in loose-housing than in stanchion barns.

MINUTES REQUIRED PER DAY

MINUTES REQUIRED PER DAY

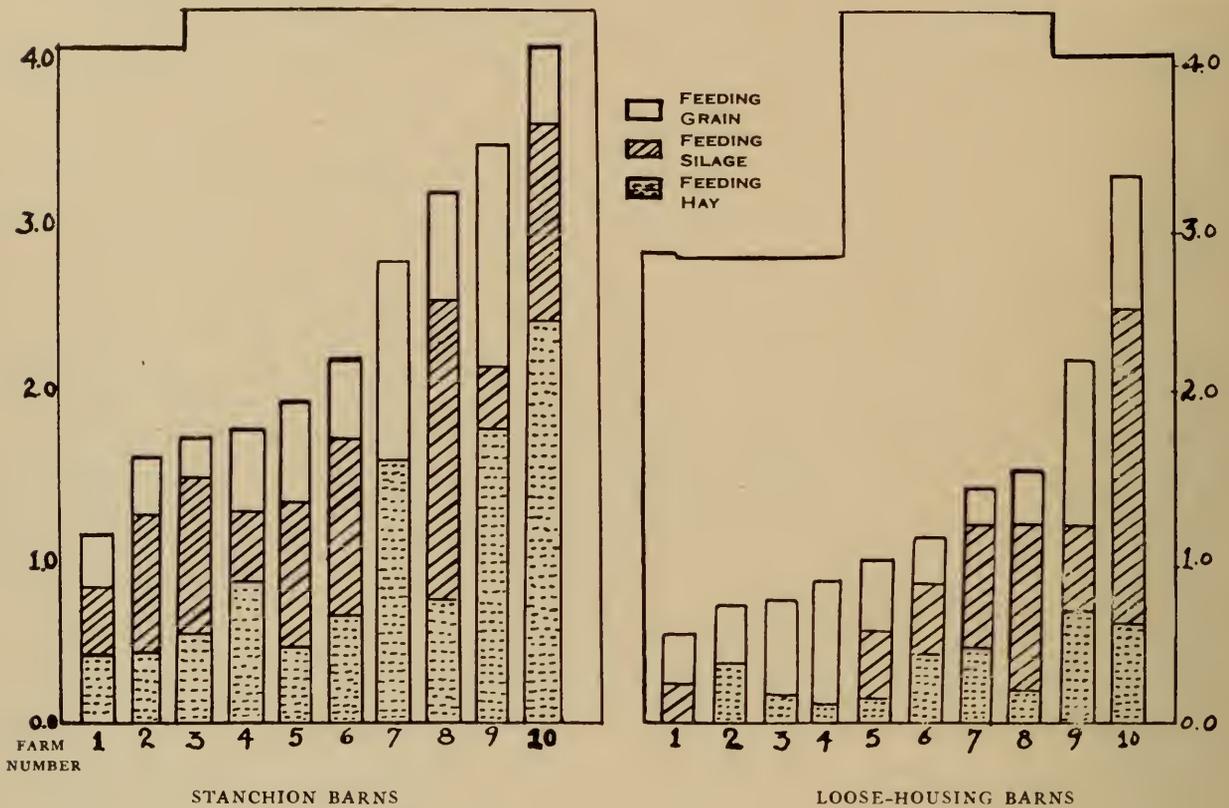


FIGURE 5.—Time requirements per cow for feeding operations.

### LABOR SAVING IN THE BARN

To show what can be done under different circumstances to ease the labor tension in dairying, three cases are described indicating what the farmers actually did, how they succeeded in overcoming difficulties and how much success they are having today. These cases include:

*Case I—Saving labor in chore routines with little capital expense.*

*Case II—Saving labor economically through changes in barn layout.*

*Case III—Simplifying dairy chores when the capacity of a building is the limiting factor.*

Although no two farms are exactly alike, the method of approaching the labor problem in these case studies will be useful to those who contemplate making a change.

**CASE I. Saving Labor in Chore Routines with Little Capital Expense.**—Changes in chore routine at a cost of less than \$10.00 resulted in savings of 256 hours of labor and 42 miles of walking a year. This is how it was done.

In 1949, this farmer became a member of the Dairy Herd Improvement Association of Ontario. Shortly after receiving some literature on the time and motion technique of studying dairy barn chores he decided to enlist the help of a friend who was in sympathy with his aims. Through the use of papers, pencil, clip-board and watch, the friend was able to record all jobs performed, the time required for each job and the distance travelled while the farmer went about his tasks in his usual manner.

An analysis of the time and motion data obtained revealed that the operator required only  $6\frac{3}{4}$  minutes and 354 steps per cow per day to do the summer chores. A similar study during the winter showed that  $14\frac{1}{3}$  minutes and 636 steps were needed per cow per day to do the chores. The farmer was not satisfied, and determined to reduce time requirements still further and yet keep up the high quality of milk that had always been produced.

In order to save chore time each job was examined closely with a view to eliminating or combining steps or tasks and making other improvements wherever possible. The new routine saved almost a month a year. The major savings made are illustrated in Fig. 6.

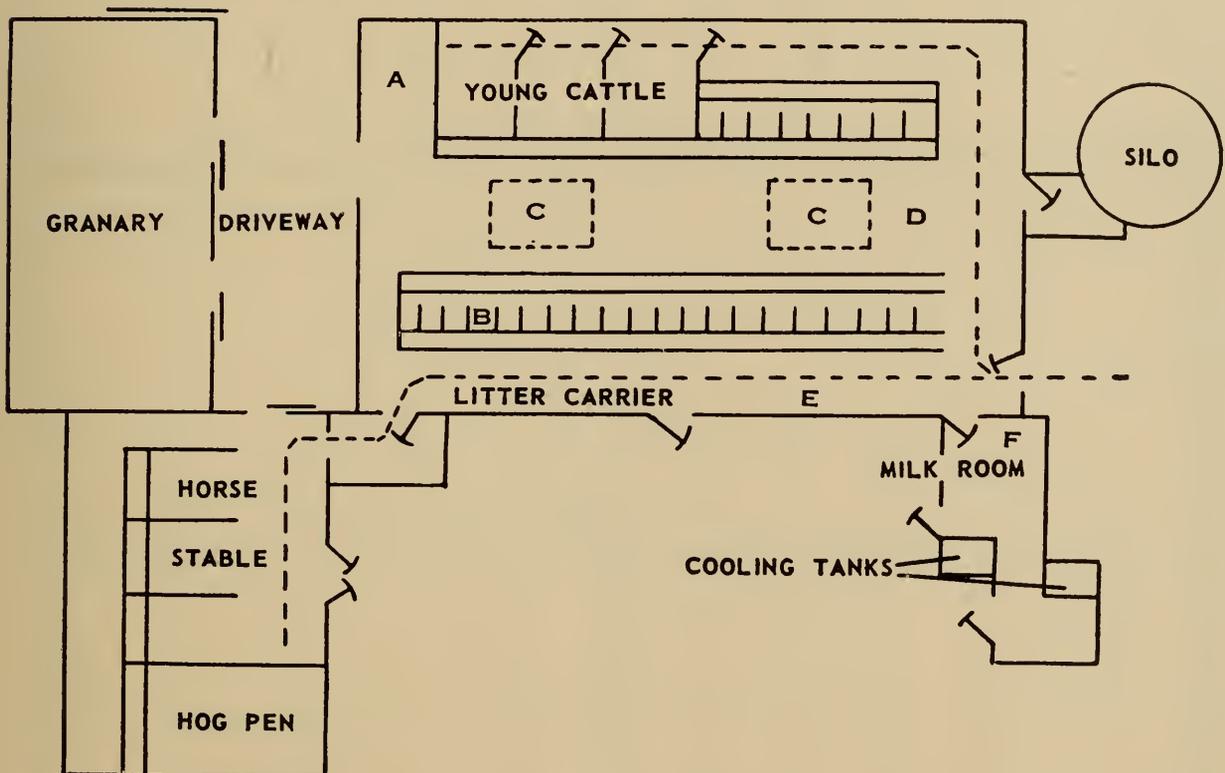


FIGURE 6.—Total changes in chore routine saved 256 hours of labor and 42 miles of walking in one year for less than \$10.00. Individual savings were small but many savings 730 times a year really added up.

- A. Grain scoop of known size—saved 11 hr.
- B. Milker time reduced from 7 minutes to  $5\frac{1}{2}$  minutes per cow—21% saving. Machine stripping closely watched—21 hr. saved.
- C. Sliding doors placed at bottom of hay chutes saved 17 hr. and 15 miles of walking.
- D. Extended slope enabled silage cart to move easily. Saving—44 hr. and 8 miles of walking.
- E. Extra pail and strainer avoided delays. Saving—16 hr.; 9 miles of walking.
- F. Good cleaning solution plus repaired teat cup rack plus can rack conveniently placed saved 61 hr.

Changes in chore routine such as those tried by this farmer can be made on any dairy farm with very little capital expense. Usually, it requires only a questioning attitude towards every part of the routine and recognition of the need for a change. In future years, if the herd size on this farm is to be increased, greater labor efficiency may be expected by having 36 stanchions in two even rows, and converting the driveway, part of the granary, horse stable and hog pen into a loose-housing area for young cattle and dry cows.

**CASE II. Saving Labor Economically Through Changes in Barn Layout.**—Renovations in barn layout saved 438 hours of labor and 267 miles of walking each year. How one farmer achieved this goal will be described.

This farmer, with recent industrial training, took over the farm seven years ago. He had lived on a farm in his youth but was not familiar with up-to-date farming methods, so decided to do the work in the same manner as his predecessor. He was surprised that it required so many hours to do the dairy chores: during the busy summer months it took over 16 minutes per cow, a total of  $6\frac{1}{2}$  hours each day. He decided to study various methods of handling dairy cows to see if he could work out a plan to improve his chore routine. Two years later he felt sufficiently qualified to undertake improvements to his dairy barn. (Fig. 7).

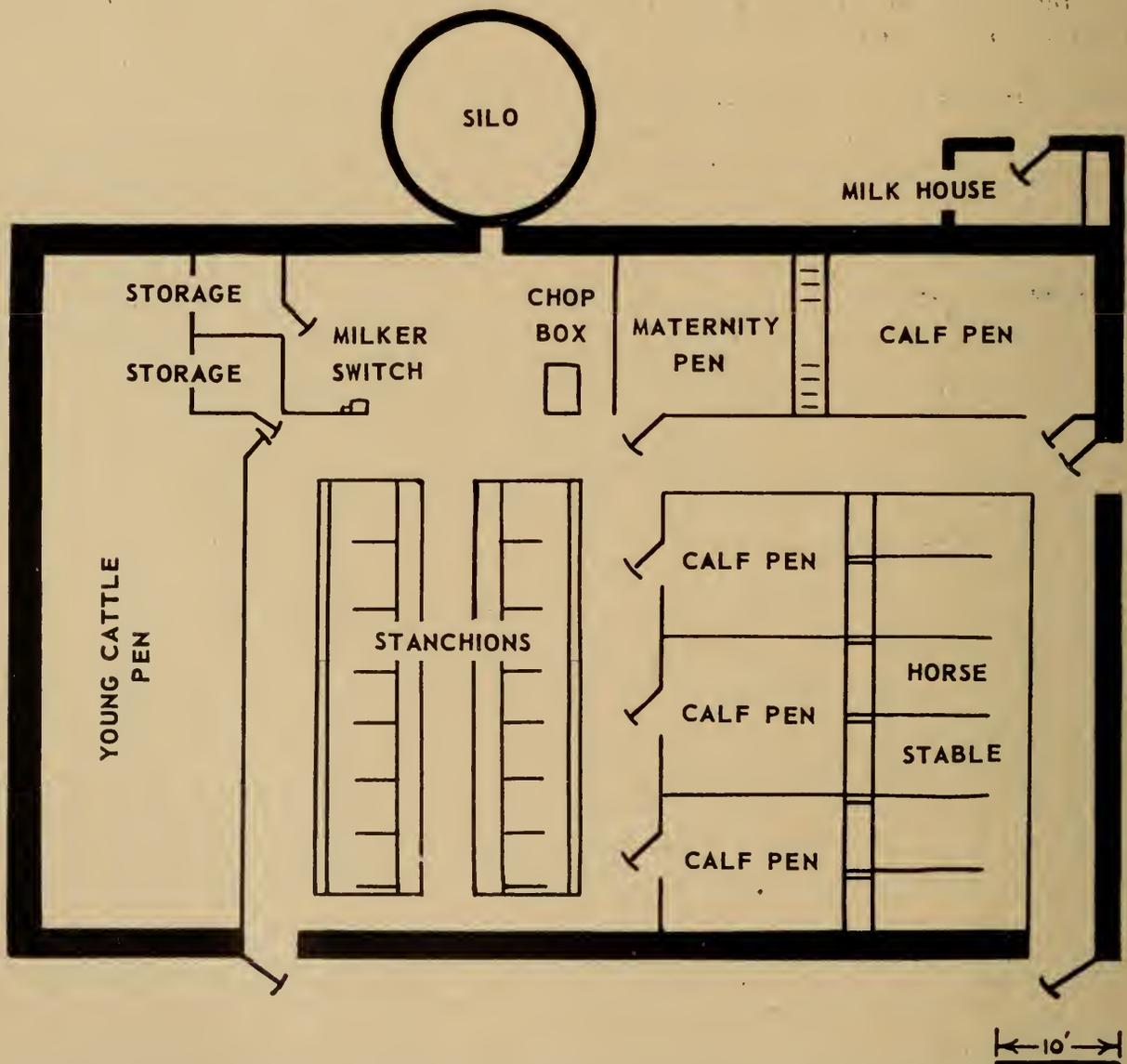


FIGURE 7.—Barn 2—layout in 1947. Sixteen minutes and 657 steps per cow were required to do the chores.

The first major change in the barn was to remove half the stanchions and box stalls to provide for a loafing area (Fig. 8). One row of stanchions was left in place and the cows, after milking, were let in the loafing area. A small room was converted into a temporary milk room thus saving the operator the bother of going outside each time the milk and equipment were stored. Important savings in time resulted from these changes. Where formerly it had required 16 minutes per cow during the summer, with the new layout this was cut to 12 minutes per cow for milking plus all other chores even in winter.

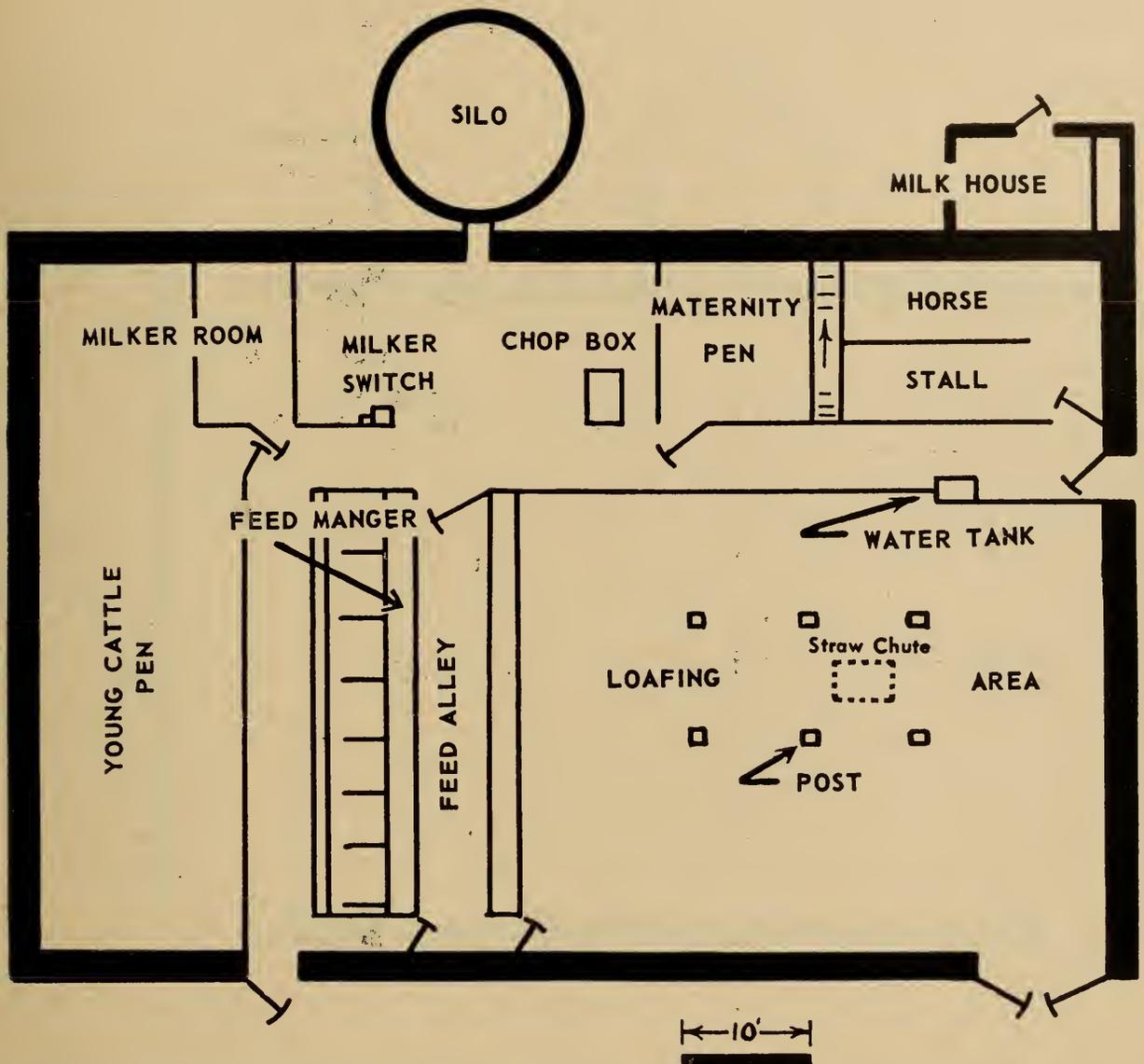


FIGURE 8.—Barn 2—the first major change in modernizing the barn. A loafing area was formed by removing half the stanchions, calf pens and horse stable. The only cost was the operator's labor.

Satisfied that the loose-housing system would work under these conditions, this operator began looking over drawings and pictures of milking parlors. He decided to build one. Being handy with an acetylene torch, he bought two-inch used pipe for \$10.00 and set about the task.

He first removed the old horse stalls and dug a pit. With an investment of \$153.40 (cement and lime \$19.40, excavation and gravel \$65.00, cement blocks \$19.00, used two-inch pipe \$10.00, hinges \$15.00 and ceiling sheets \$25.00) he built the three-stall milking parlor. A water pressure system and a pipeline milker were then installed.

By making a door and enlarging the milk house the new system was almost ready for use. Previously, the loafing area was fenced in with wooden posts. Having a surplus of steel posts, this operator welded them together to make a more permanent partition. The old stanchions were removed and a large heifer pen and large calf pen were built. A feed alley then ran between the loafing area and the heifers. Two hay chutes were placed above the manger. Hay forced through the chutes filled the manger eliminating the need for handling the hay twice. Straw chutes were placed in both the heifer and calf pens and two large outside doors installed (Fig. 9). A breakdown by jobs shows where the major changes in time and distance took place (Table 6).

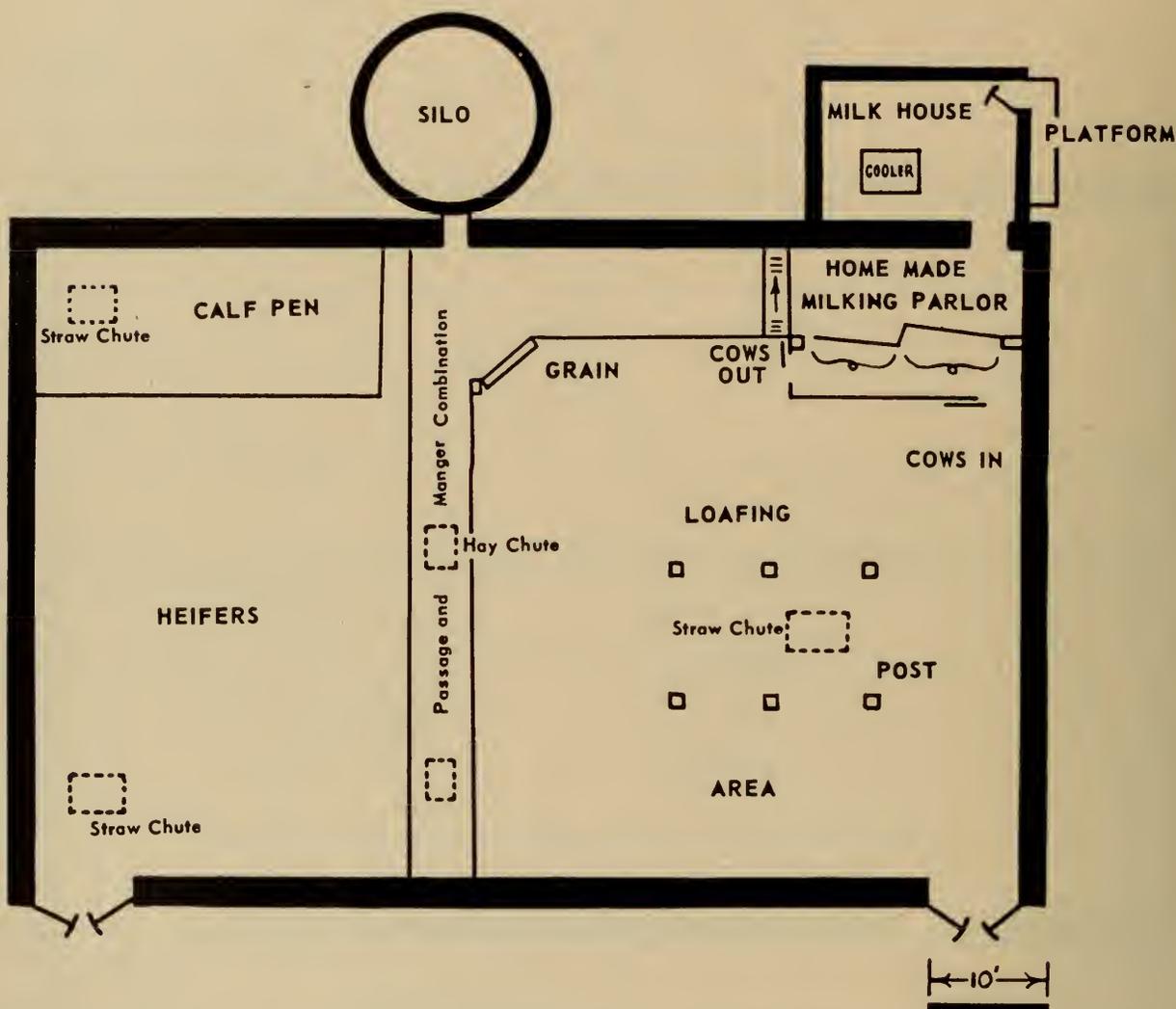


FIGURE 9.—Barn 2—present layout. Changes in layout saved 438 hours and 267 miles of walking each year.

This farmer plans to increase his herd but to look after it with the same labor. Further changes are, therefore, necessary. It is planned to feed hay outside in hay racks. Silage will no longer be pushed along in a cart but with the installation of a second hand blower at the silo the silage can be blown to wherever needed. At present, drainage is not a major problem because of the slope of the land. With a larger herd, however, a paved yard will probably be necessary.

How much could this farmer afford to invest in improvements? With labor valued at 75 cents per hour he saved \$329.00 over the year. The annual cost<sup>1</sup> of this saving is about ten per cent of the original investment. Therefore, the maximum he could afford to spend on making changes is \$329.00 multiplied

<sup>1</sup> Annual cost includes: depreciation, interest, insurance, taxes and repairs.

by 10 which equals \$3,290.00. The changes in this case cost considerably less and, therefore, were very worthwhile.

**Table 6.—Major Changes in Time and Distance After Remodelling**

	Savings or Increase in Time per Year		Savings or Increase in Distance Travelled per Year	
		hours		miles
Prepare equipment.....	increase	0.8	saving	14.3
Prepare cow; wash.....	saving	36.6	"	17.3
Handle milker.....	"	13.0	"	57.2
Care for milk.....	"	126.0	"	74.6
Handle cows.....	"	20.0	..	..
Hand strip.....	"	65.6	saving	11.1
Machine strip.....	"	21.8	increase	1.3
Wait.....	increase	75.6	..	..
Wash equipment.....	saving	70.0	saving	8.7
Feed hay.....	"	84.6	"	24.6
Feed silage.....	"	30.0	"	8.5
Feed grain.....	"	..	"	6.2
Clean stable.....	"	13.5	"	19.3
Bedding and sweeping.....	"	13.6	"	19.3
Feed and water calves.....	"	20.2	"	7.5
<b>Total saving.....</b>	..	<b>438.5</b>	..	<b>267.5</b>

**CASE III. Simplifying Dairy Chores when the Capacity of a Building is the Limiting Factor on a Dairy Farm.**—This farm is located on high-producing well-drained land. Through mechanization and a good fertility program more feed was being grown than consumed. A good fluid-milk market was close by and the farmer was anxious to supply as much milk as possible. The limiting factor was the size of the stanchion barn. As shown in Fig. 10, this barn is larger and much better planned than many on the farms in Ontario. The cows were facing out in two long rows. Large doors at either end of the barn enabled a spreader and tractor to be driven through in order to simplify cleaning. As the cows were milked, the milk was dumped into one of six eight-gallon cans suspended from a milk carrier track. Walking was reduced to a minimum with only two trips to the milk house each milking. It was indeed a well-run dairy routine with the milk cart, strainers, hot water, cloths and scales right at hand.

The fact remained, though, that this barn would hold only 30 milking cows and young stock. It was the aim of the farmer to have 60 cows milking and to raise his own stock. He then had to decide whether to extend his present barn, build another stanchion barn, or consider loose housing.

The present barn was over 100 feet long. An extension to this two-storey structure did not seem to provide the answer. It was a question of another stanchion barn or a loose-housing system. After much thought, a one-storey structure was built adjacent to the stanchion barn (Fig 11). The stanchions were removed and the area converted into temporary pens. The young cattle pens then became the new waiting area. A four-unit milking parlor was installed with a pipe-line milker to a new milk house. Cows then walked up the ramp from the waiting area into the milking area, and after milking went through a door at the opposite end into the loose-housing area.

Was much labor saved in this change-over? Not as much as might be expected. With herds of the same size about 30 minutes per day was saved. The major advantage to this system was that as many cows could be kept on the farm as the feed and other resources permitted. Savings or increases in time and distance are given in Table 7.

The actual cost of the change-over was \$11,500. Savings in labor valued at 75 cents per hour warrant a maximum investment of \$2,700. The remaining

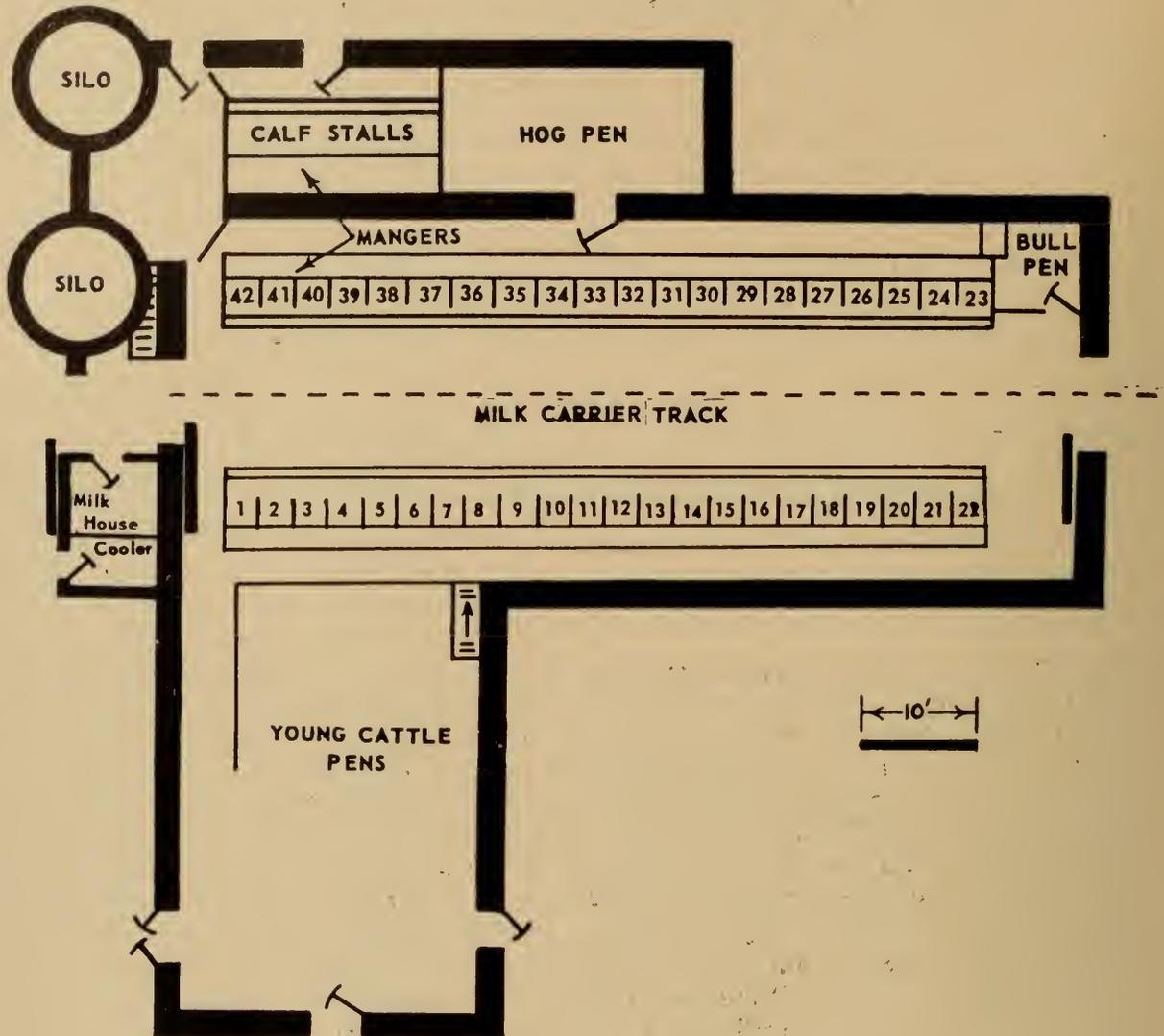


FIGURE 10.—Barn 3—An excellent stanchion barn requiring only 10 minutes and 270 feet per cow per day to do the chores.

Table 7.—Major Changes in Time and Distance Per Year After Remodelling

	Savings or Increase in Time		Savings or Increase in Distance Travelled	
		hours		miles
Prepare equipment.....	saving	6.1	loss	16.5
Prepare cow; wash.....	"	6.6	"	5.9
Handle milker.....	loss	1.1	"	34.4
Care for milk.....	saving	120.5	"	34.3
Handle cows.....	loss	112.8	"	22.9
Hand strip.....				
Machine strip.....	saving	128.6	saving	10.4
Wait.....	loss	107.3		
Wash equipment.....	saving	100.4	loss	12.6
Feed hay.....	loss	27.9	saving	4.6
Feed silage.....	saving	26.8	"	18.8
Feed grain.....	loss	23.4	"	7.0
Clean stable.....	saving	44.8	"	18.8
Bedding and sweeping.....	loss	2.2	"	
Feed and water calves.....	saving	21.2	"	16.3
	<b>saving</b>	<b>180.3</b>	<b>loss</b>	<b>50.7</b>

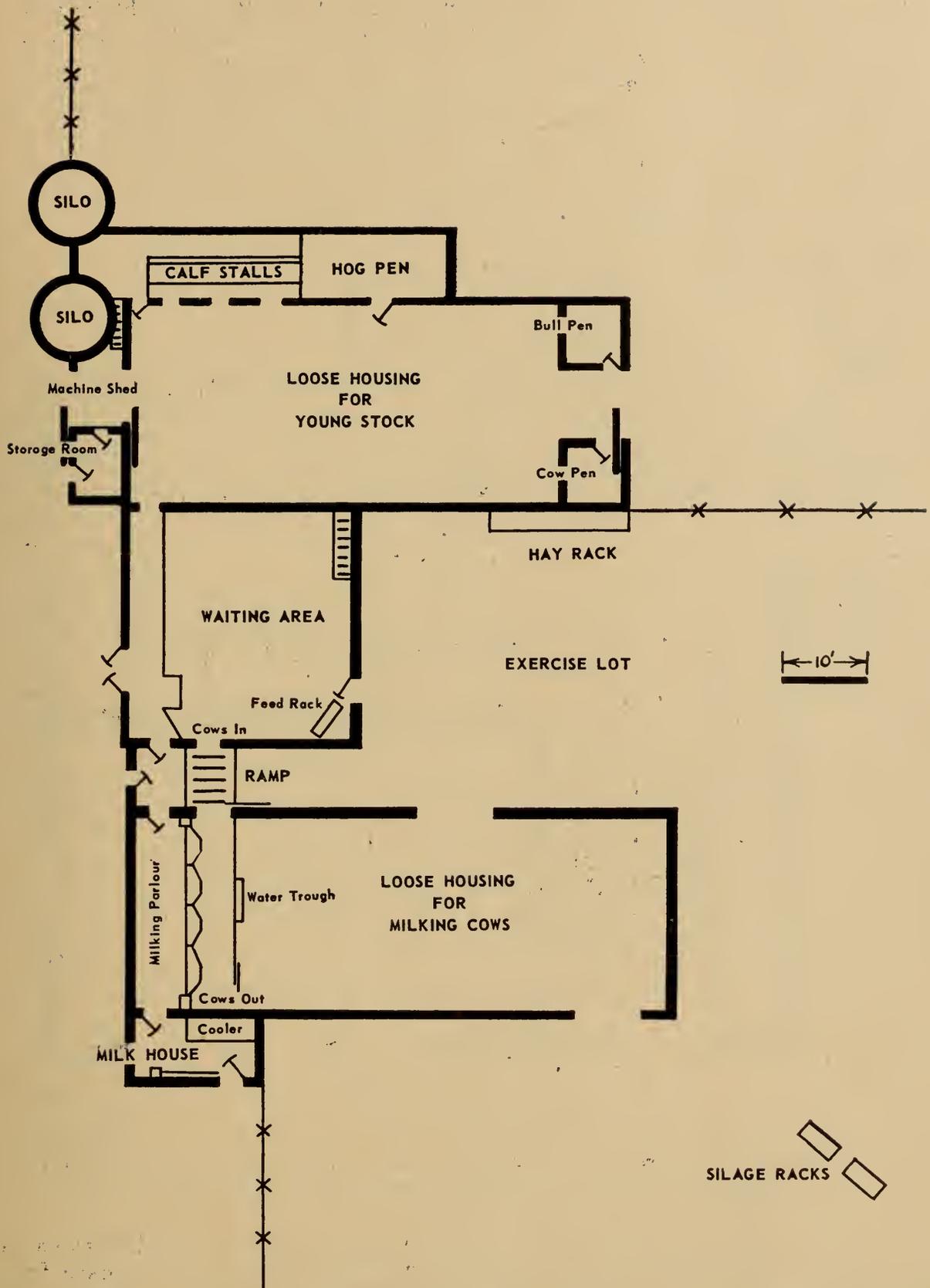


FIGURE 11.—Barn 3—The cost of this renovation was \$11,500. Barn size is no longer a limiting factor.

\$8,800 must be taken out of the net returns for the 60-cow herd. After noting how net returns are affected by this type of improvement, many farmers are anxious to review this situation to see if there is not a less expensive way to increase the housing space for a larger sized herd. Actually there is a less expensive way. If the number of cows to be milked does not exceed 60, then stanchions may be

arranged as shown in Fig. 12. The double door in the calf pen could be placed at the end of the barn and a one-story pole-type structure built for the young stock and dry cows. Two walls are already built so the major cost would be a setting up of poles and the building of a roof. Hay and silage could be provided outside for the stock as is being done today. The milk cart would still be an important labor-saving device and it would still be possible to use the tractor and spreader when cleaning out the gutters. Feed storage has never been a problem as the structure recently built was not for this purpose.

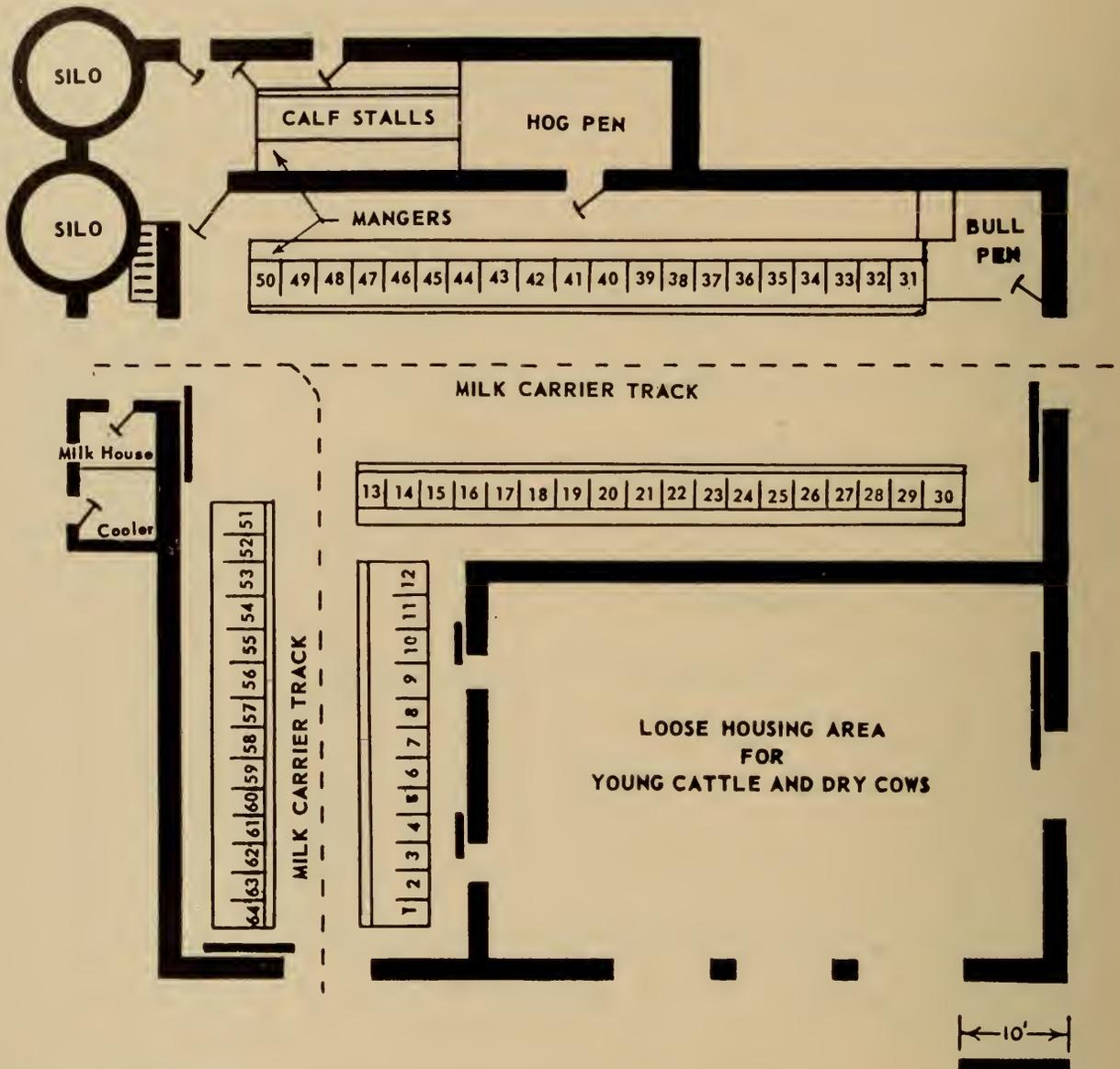


FIGURE 12.—Barn 3—An alternative to Figure 11 would be to increase the number of stanchions and build an inexpensive pole structure for the young cattle.

Another solution would be to remove the stanchions and use all of the area for loose housing. With calf pens located in the bedded area, 70 square feet<sup>1</sup> per milking cow is required. Under this arrangement (Fig. 13), the barn could hold 65 to 75 milking cows. A milking parlor could then be installed in place of the calf stalls and part of the hog pen with savings in time in the loose-housing system about paying for its cost. By feeding hay and silage outside and by building a milk room next to the milking parlor, an efficient loose-housing system would be ready for use.

<sup>1</sup> *Loose Housing of Dairy Cattle*. W. Kalbfleisch, V. S. Logan, and S. W. White. Canada Department of Agriculture. Central Experimental Farm, Ottawa. May 1952, p. 5.

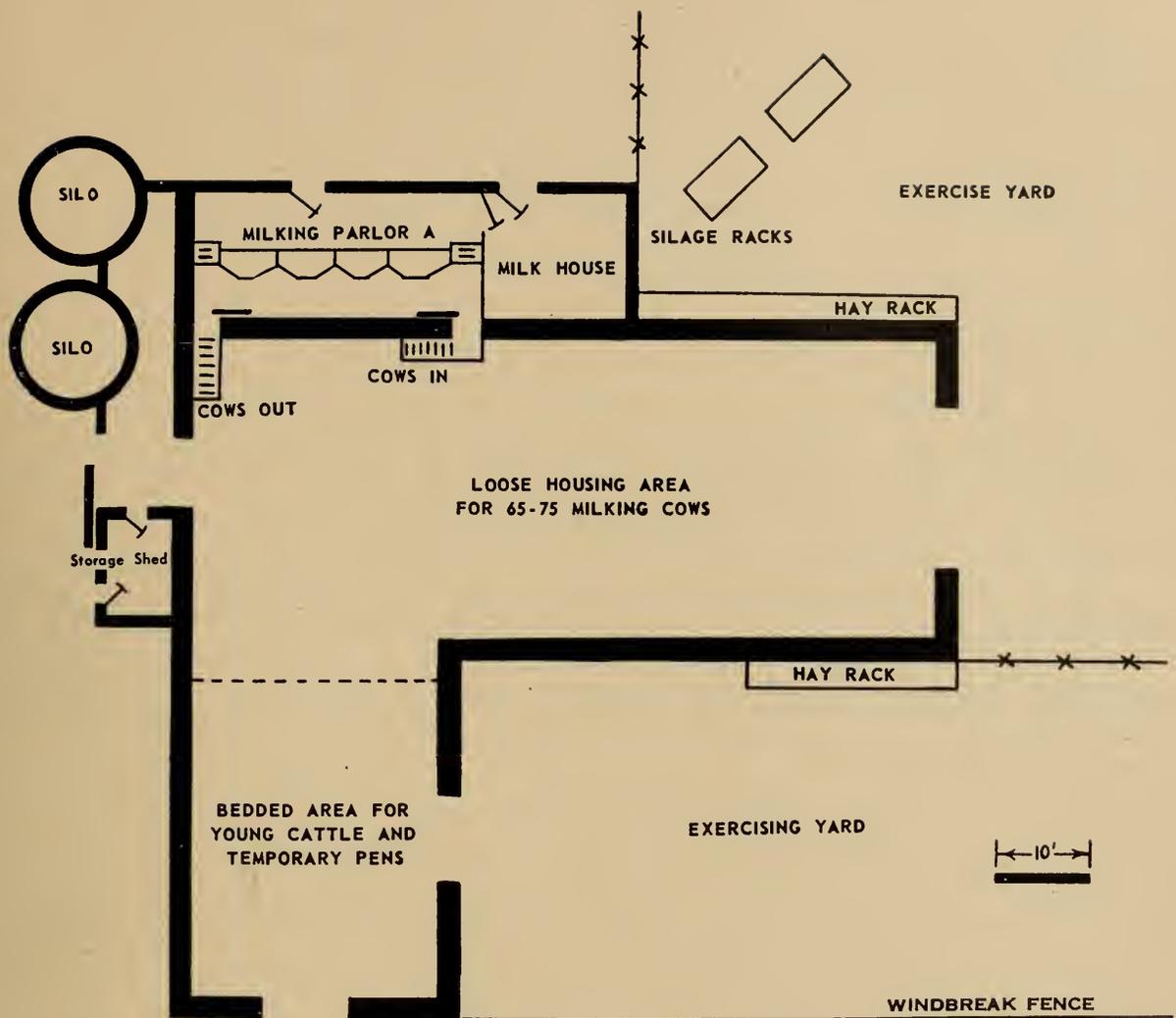


FIGURE 13.—Barn 3—Another alternative to Figure 11 would be to convert the whole area into loose housing. Only 70 sq. ft. per cow is required when calf pens are located in the bedded area.

Major alterations or changes can be expensive. It is always wise to examine alternatives which may give the flexibility and efficiency that are required, at much less cost. Money invested at five per cent will double its value in twenty years. If a change in a farm building will not yield this return, other solutions to the problem should be sought.

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QUEEN'S PRINTER AND CONTROLLER OF STATIONERY  
OTTAWA, 1954.